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<p>(21) International Application Number: PCT/US83/00175</p> <p>(22) International Filing Date: 10 February 1983 (10.02.83)</p> <p>(31) Priority Application Number: 351,042</p> <p>(32) Priority Date: 22 February 1982 (22.02.82)</p> <p>(33) Priority Country: US</p> <p>(71)(72) Applicant and Inventor: LURAY, Howard, L. [US/US]; 15730 Beach Drive Northeast, Seattle, WA 98155 (US).</p> <p>(74) Agent: BROWN, Ward; Beach & Brown, 3107 Eastlake Avenue East, Seattle, WA 98102 (US).</p> <p>(81) Designated States: AT (European patent), AU, CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), SE (European patent).</p>		<p>Published <i>With international search report.</i></p>
<p>(54) Title: PROTECTIVE PACKAGES</p> <div data-bbox="454 1081 1347 1785"> </div> <p>(57) Abstract</p> <p>A cradle (2) of substantially rigid material extends between the opposite ends of an outer rigid box (1) and supports a fragile article out of contact with the box walls. The opposite sides of the cradle extend along but are spaced inward of opposite sides of the box. Integral shock-absorbing corrugations form strips (12, 13 or 33 or 46) extending transversely of the cradle. The cradle includes integral upright legs (10 or 10' or 49) fitted over the opposite ends of the base (4 or 4') of the box and a box lid (5 or 5') is telescoped downward over the legs. The fragile article can be held in a cavity (3) in the cradle or be supported in an aperture (32 or 41) in the cradle. In either instance the shock-absorbing corrugations permit flexing of the cradle should the box be jolted or jostled during shipping or handling for protecting the fragile article.</p>		

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Description

Protective Packages

Technical Field

5 My invention relates to special packaging for a fragile article and, more specifically, to the general type of package which includes an outer rigid box and an inner shock-absorbing hammock or cradle extending between opposite ends or sides of the box and supporting the fragile article.

10 Background Art

Prior packages of the type with which the present invention is concerned have used an outer box of substantially rigid material such as heavy corrugated cardboard and an inner "hammock" of flexible material
15 such as thin plastic sheets or "films" enclosing a fragile article to be packaged and stretched between opposite ends or sides of the box.

For example, in the package disclosed in U.S. patent No. 2,501,570, which issued on March 21, 1983 in
20 the name of Larsen, a fragile article to be packaged is sandwiched between upper and lower flexible thermoplastic films which have their outer margins heat-sealed or welded together. The margins of the sheets then are draped over and are secured to the periphery of the
25 base of a rigid box and the box can be closed by a separate lid. The fragile article is suspended inside the box by the stretched, shock-absorbing, flexible plastic films.

A problem with the prior "hammock type" protective packages is that it is difficult to secure
30 the ends or margins of the flexible material to the walls of the rigid box while assuring that sufficient tension is maintained to suspend the fragile article out of contact with the bottom of the box -- yet without



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applying an excess of tension which could weaken the thin flexible hammock and cause it to break should the package be subjected to an abrupt shock. In addition, each hammock package has to be specially designed for the specific fragile article to be packaged.

The problems of the prior hammock type packages were addressed by the hammock package of my earlier U.S. patent No. 3,853,220, which issued on December 10, 1974. In that package, while the central, article-enclosing portion of the hammock still is formed of thin, flexible thermoplastic material, the opposite ends of the hammock are secured to rigid legs which extend over opposite ends of the base of a rigid outer box. As the lid of the box is telescoped over the base, it engages the legs and swings them downward against the sides of the box base to stretch the flexible hammock extending between the upper parts of the legs. Still, there is difficulty in securing the opposite ends of the hammock to the rigid legs; and the positions at which the ends of the hammock are secured to the legs are critical to assure proper tension of the hammock after the lid of the box is telescoped over the base. As a result, each package still has to be specially designed for the fragile article to be packaged and special care is required to assure that the ends of the hammock are secured to the rigid legs reliably and in the proper positions. Although much effort and expense has been devoted to providing special equipment enabling mass production of the packages, up to now a commercially practical assembly operation has not been found.

Disclosure of the Invention

In accordance with the present invention I provide an outer rigid box and a shock-absorbing cradle of substantially rigid thin plastic material extending inside the box and supporting the article out of contact with the box walls. In a preferred embodiment of the



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invention, the cradle has integral corrugations enhancing its shock-absorbing characteristics and includes integral legs projecting downward from its horizontal, article-supporting central portion. The legs are fitted over
5 the ends of the base of the box. The sides of the cradle are spaced inward of the sides of the box a substantial distance and the shock-absorbing corrugations are arranged in strips extending laterally of the cradle central portion toward its opposite ends.

10 The article to be packaged is conveniently supported in an opening in the cradle. A lid or a separate container can be provided for enclosing the article. Alternatively, the cradle can be formed in two interfitting sections having complementary cavities
15 for enclosing the article.

Separate cradle sections can have interfitting recesses and projections so that they may be joined in snap fit engagement. A similar snap fit detent mechanism
20 can be provided to hold the cradle on the base of the box and to hold a box lid telescoped over the cradle and the box base.

Brief Description of Drawings of the Preferred Embodiment

The details of my invention will be described in connection with the accompanying drawings of my
25 preferred embodiments in which,

Figure 1 is a somewhat diagrammatic top perspective of a protective package in accordance with the present invention which includes an outer rigid box and a shock-absorbing, inner, article-suspending cradle,
30

Figure 2 is a longitudinal vertical section of a rigid box usable in the present invention, and Figure 3 is a fragmentary, enlarged, vertical section of a portion of such box,

Figure 4 is a top plan of the article-suspending cradle shown in Figure 1, and Figure 5 is a
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fragmentary top perspective of a portion of a modified cradle,

Figure 6 is a somewhat diagrammatic top perspective of a second embodiment of a protective package in accordance with the present invention which also includes an outer rigid box and an inner article-suspending cradle, Figure 7 is a somewhat diagrammatic top perspective of the article-enclosing portion of such cradle, Figure 8 is a top plan of the supporting portion of such cradle, and Figure 9 is a somewhat diagrammatic, fragmentary, top perspective of a portion of the supporting portion of such cradle, and

Figure 10 is a somewhat diagrammatic, exploded, top perspective of a third embodiment of a protective package in accordance with the present invention, Figure 11 is an enlarged, fragmentary, vertical section of a portion of such package showing the parts in assembled relationship, and Figure 12 is an enlarged, longitudinal, vertical section of the central portion of such package showing the article-enclosing portion of the package.

Best Mode for Carrying Out the Invention

In the embodiment shown in Figure 1, the protective package in accordance with the present invention includes an elongated, shock-absorbing cradle 2 having a central opening in the form of a cavity 3 for holding a fragile article to be packaged. The cradle extends between the opposite ends of the rectangular base 4 of a rigid box 1 which preferably includes a lid 5 that may be telescoped downward over the box base. The fragile article secured in the cradle cavity is maintained out of contact with the walls of the outer rigid box, and the shock-absorbing characteristics of the cradle prevent damage to the article as the box is jolted or jostled during shipping or handling.



Preferably the outer box is formed of thermoplastic material such as polyvinyl chloride of a thickness sufficient to assure rigidity. The thermoplastic material can be conveniently blow molded to the closed hollow condition indicated in Figure 2 in a mold defining the rectangular base 4 connected to the rectangular lid 5 by a narrow joining section 6 between them. As indicated in Figure 3, the box can be severed in the area of the joining section between the base and lid, such as by a saw or a hot knife, to form the separate base and lid sections of the box. The upright peripheral walls of the base and lid are flared outward from the bottom of the base and the top of the lid, respectively, so that the bases and lids may be nested for shipment but, since in use it is preferred that the lids telescope over the bases, the upper portion 7 of the upright base wall and the lower portion 8 of the upright lid wall should be parallel and substantially vertical, such as between lines L1 and L2 indicated in Figure 3.

The separate cradle 2 of the package also is substantially rigid material, preferably thermoplastic material such as polyvinyl chloride. As shown in Figures 1 and 4, the cradle includes a generally planar central portion 9 having the article-containing opening or cavity 3. The length of such central portion is approximately equal to the length of the base 4 of the box, but such portion is substantially narrower than the width of the box.

Legs 10 are formed integral with the central cradle portion, project perpendicularly downward from its opposite ends and extend widthwise beyond its opposite sides. Stop flanges 11 are formed integral with the legs and project outward from their bottom edge portions.

Also formed integral with the central portion of the cradle are transversely extending strips 12 and 13 of shock-absorbing corrugations disposed toward the



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opposite ends of the cradle, respectively. The corrugations give resilient flexibility to the otherwise substantially rigid cradle. Each strip of corrugations allows up-and-down flexing of the cradle, the strip 12 toward one end of the cradle has widthwise extending corrugations promoting longitudinal flexing of the cradle and the strip 13 toward the other end has endwise or lengthwise extending corrugations promoting widthwise or transverse flexing of the cradle.

The fragile article to be packaged may be secured in the cavity 3 such as by taping or gluing or by a strip of pressure-sensitive adhesive held in the bottom of the cavity. In the embodiment shown in Figures 1 through 4, however, the central portion of the cradle is formed with an integral lid or flap section 14 projecting transversely from the remainder of such central portion in the area of the cavity 3 and having an opening or cavity 15 shaped complementally to cavity 3. A thinner strip of the thermoplastic material forms a hinge joint 16 intermediate the two cavities. When the flap is folded over about the hinge joint onto the remainder of the cradle central portion, the two cavities are in registration. The flap may be secured in folded over condition to enclose the fragile article within the cavities by integral lock tabs 17 projecting from the free end of the flap and received in slots 18 at corresponding locations of the main cradle portion to provide a snap-fit connection, or the flap may be taped, glued or heat-sealed or welded in folded over condition.

After the fragile article has been secured in the cradle cavity or cavities, assembly of the protective package is completed by fitting the cradle legs 10 over the opposite ends of the base 4 of the rigid box and telescoping the lid 5 downward over the legs into engagement with the stop flanges 11. Since the opposite lateral sides of the central, article-containing portion of the cradle are spaced inward a substantial distance



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from the adjacent longitudinal walls of the box, substantial room is provided for transverse, shock-absorbing motion of the cradle without it coming into contact with the walls of the box. Also, the legs 10 projecting downward from the cradle extend substantially the full width of the box so that the cradle cannot slide widthwise of the box without the upright sides of the legs engaging the lower portion of the box lid telescoped over them.

10 In the modification shown in Figure 5, the length of the cradle central portion 9' is slightly less than the distance between the outer sides of the upright ends of the box (not shown), and the legs 10' are inclined outward slightly from the opposite ends of such shortened cradle central portion. After the lower 15 portions of the legs are fitted over the opposite ends of the box base, the box lid is telescoped downward over them, swinging the legs inward against the ends of the box base in the direction of the arrow in Figure 5. 20 Accordingly, the central portion of the cradle is placed under slight tension so as to make it somewhat less flexible or floppy. In other respects the modified form of the invention shown in Figure 5 is identical to the form shown in Figures 1 through 4.

25 In the embodiment of the present invention shown in Figures 6 through 9, the outer rigid box is substantially the same as for the form shown in Figures 1 through 5 with the exception that the corners 20 between the side and end walls of the box base 4 and lid 5 are substantially more rounded. Rather than 30 having a central portion substantially narrower than its integral legs, the cradle 21 is of uniform width throughout its length including the legs 22 and stop flanges 23, but still is substantially narrower than 35 the width of the box base 4. With the lid 5 telescoped over the cradle legs 22, transverse sliding of the cradle is prevented by engagement of the opposite upright sides of the legs with the rounded corners of



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the box lid, so that the outer sides of the cradle still are spaced inward a substantial distance from the inner sides of the rigid box to allow the transverse, shock-absorbing movement of the cradle central portion.

5 In addition, as shown in Figures 7 and 8, rather than forming cavities integral with the cradle, in the embodiment of Figures 6 through 9 a separate container 24 is provided for the fragile article to be packaged. Such container can be conveniently vacuum
10 formed from thermoplastic sheet material with a base section 25 and lid section 26 hinged together by a thinner joining section of such material. The sections 25 and 26 have complementary cavities for receiving the fragile article. The margins of the lid and base
15 sections form integral support flanges 27 projecting outward from the article-enclosing portions of the lid and base sections and, after such sections have been folded so as to enclose the fragile article to be packaged, the flanges can be glued or heat-sealed or
20 welded together.

A further modification of the embodiment of Figures 6 through 9 is the provision of a double thickness cradle having separate top and bottom portions 28 and 29, respectively, which, as shown in Figures 8 and
25 9, may be molded integral with each other with a thinner section of material forming a hinge joint 30 between them. Each section includes a generally planar central portion 31 having an opening in the form of an aperture 32 at its center which, when the top section 28 is
30 folded over onto the bottom section 29, registers with the aperture in the other section. As best seen in Figure 9, initially the integral cradle legs 22 project upward from the top section 28 and downward from the bottom section 29 so that the legs of the upper section
35 will nest over the legs of the lower section as the cradle is folded.

Still another modification of the embodiment of Figures 6 through 9 is the provision of transversely



extending strips 33 of oppositely directed, diagonal corrugations toward the opposite ends of the central portion of each cradle section, which promote both longitudinal and transverse flexing of the cradle. As
5 best seen in Figure 6, when the top cradle section has been folded over onto the bottom cradle section, each corrugation registers with a corrugation in the other cradle section.

In assembling the package shown in Figures 6 through 9, the fragile article is placed in the separate
10 article container 24 and enclosed therein by folding over the lid section 26 onto the base section 25. The closed container then is placed in the aperture 32 through the bottom cradle section 29 with the support
15 flanges 27 resting on the inner margin of the cradle adjacent to such aperture. Next the top cradle section 28 is folded over onto the bottom cradle section 29 with its aperture 32 being fitted over the lid section 26 of the separate article container as the folding
20 operation is completed. The cradle sections can be secured together if, for example, a hermetic seal is desired around the fragile article. The legs 22 of the assembled cradle then are fitted over the opposite ends of the base of the box 4 and the lid 5 is telescoped
25 downward over them until it engages the double thickness stop flanges 34 projecting outward from the legs.

In the form of the present invention shown in Figures 10 through 12, as in the form shown in Figures 6 through 9, the article-supporting cradle includes
30 substantially complementary top and bottom sections. Only the bottom section 40, however, has a central opening in the form of an aperture 41 for receiving the open topped article container 42 which has a central cavity 43 for receiving the fragile article to be
35 packaged. Integral support flanges 44 project outward from the cavity-forming portion of the container and rest on the upper surface of the bottom cradle section



40 adjacent to its aperture 41 when the container is fitted in the aperture.

5 The top cradle section 45 is formed separately rather than being hinged to the bottom section. Its central portion is substantially planar so as to cover the open top of the separate article container 42, as best seen in Figure 12. The strips 46 of shock-absorbing corrugations in each cradle section, which, as in the embodiment of Figures 6 through 9, extend widthwise of the cradle toward its opposite ends, include only laterally extending corrugations. As best seen in Figure 11, the corrugations of each cradle section register with the corrugations of the other section.

10 As also shown in Figure 11, rounded, almost return bent, junctions 47 are formed between each end of a cradle central portion 48 and the corresponding leg 49 projecting downward therefrom. Each junction forms a concave recess at its inner side and a corresponding convex projection at its outer side. As the top cradle section is forced downward over the bottom cradle section, the two sections are secured together in snap fit engagement with the recesses at the inner sides of the junctions of the top cradle section receiving the projections at the outer sides of the junctions of the bottom cradle section.

15 After assembly of the composite cradle, its double thickness legs are fitted over the ends of the base 4' of the modified outer rigid box shown in Figure 10. Wide notches 50 are formed in the upper portions of the opposite ends of the box base into which the opposite end portions of the cradle are fitted as the legs are forced over the ends of the box base. As best seen in Figure 11, a convex projection 51 extending outward directly below each notch 50 is received in the concave recess at the inner side of the junction 47 of the bottom cradle section, serving as a detent deterring withdrawal of the cradle from the box base. Similarly, as the modified box lid 5' is telescoped over the legs



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to the position indicated in Figure 11 with the lower edges of its opposite ends engaging the stop flanges 52 projecting outward from the cradle legs 49, a concave recess 53 formed in the inner side of each end of the lid is snapped over the convex projection formed at the outer side of the upper cradle section to serve as a detent deterring separating movement of the box lid from the base.

Regardless of the form of the invention that is used, the fragile article to be packaged is supported by the central portion of a cradle of substantially rigid material out of contact with the top, bottom or walls of the rigid outer box. Corrugations of the cradle enhance shock-absorbing flexing without requiring use of a flexible plastic film enclosing the article. Accordingly, there is no requirement for precise stretching of such a film or making an adhesive connection of the film with other components of the package. A further advantage of the present invention is that various types of fragile articles may be suspended in one standard package rather than requiring a specially designed package for each article.

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Claims

1. A package for an article comprising a substantially rigid outer box, and a shock-absorbing cradle of thin substantially rigid plastic material having a central section extending inside said box and supporting the article out of contact with the walls of said box, said cradle further having a lid section securable to said cradle central section for covering the article supported by said cradle central section.
2. The package of claim 1 wherein the cradle central section has integral shock-absorbing corrugations.
3. The package of claim 1 wherein the cradle lid section is thin substantially rigid plastic material.
4. The package of claim 1 or claim 3 wherein one of the cradle sections has an opening for receiving the article.
5. The package of claim 1, claim 2 or claim 3 wherein at least one of the cradle sections has a cavity for receiving the article.
6. The package of claim 1, claim 2 or claim 3 wherein the cradle lid section is hinged to the cradle central section.
7. The package of claim 1, claim 2 or claim 3 including a snap-fit connection for securing the lid section to the cradle central section.
8. The package of claim 1, claim 2 or claim 3 including a hinge joint joining and integral with the two cradle sections enabling one of the sections to be folded over the other section.



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9. The package of claim 8 wherein the cradle sections have respective edges remote from the hinge joint, and including a snap-fit connection for connecting such edges to secure the cradle lid section folded over
5 the cradle central section.

10. A package for an article comprising a substantially rigid outer box, and a cradle of substantially rigid material having a central section extending inside said box and supporting the article out of
10 contact with the walls of said box, said cradle central section having integral shock-absorbing corrugations permitting flexing of said cradle central portion so as to cushion the article supported by said cradle.

11. The package of claim 1, claim 2 or claim
15 10 wherein the cradle central section has opposite sides extending, respectively, along opposite walls of the box and spaced inward, respectively, substantial distances from such walls of the box.

12. The package of claim 2 or claim 10
20 wherein the corrugations are arranged in a strip extending sidewise of the cradle central section.

13. The package of claim 1, claim 2 or claim
10 wherein the box has telescoping lid and base sections and the cradle includes integral legs projecting from
25 the opposite end portions of the cradle central section and received between said base and lid sections of the box.

14. The package of claim 12 including snap-fit detent means for securing the cradle to the box
30 base section.



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Fig. 2.

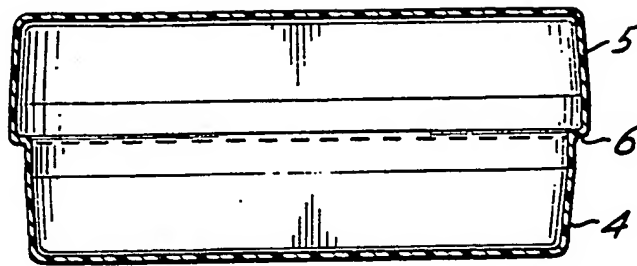


Fig. 3.

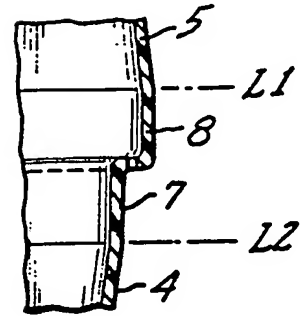


Fig. 4.

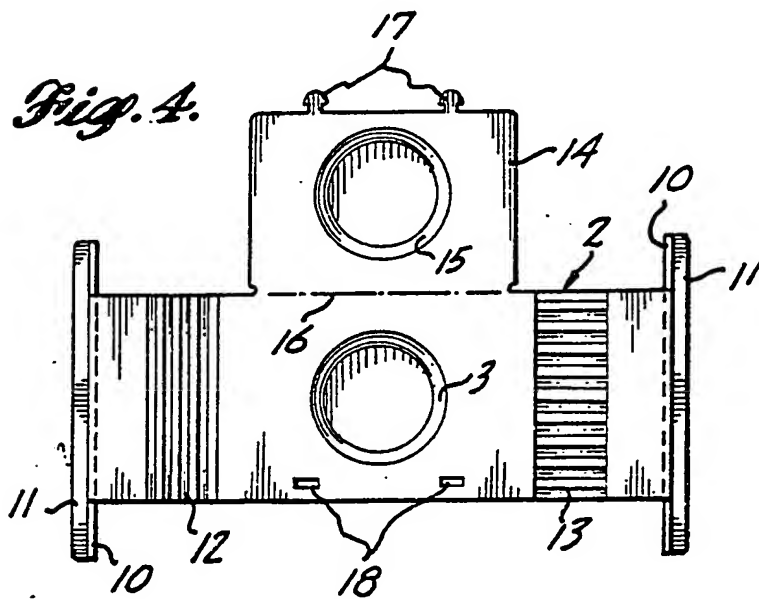


Fig. 5.

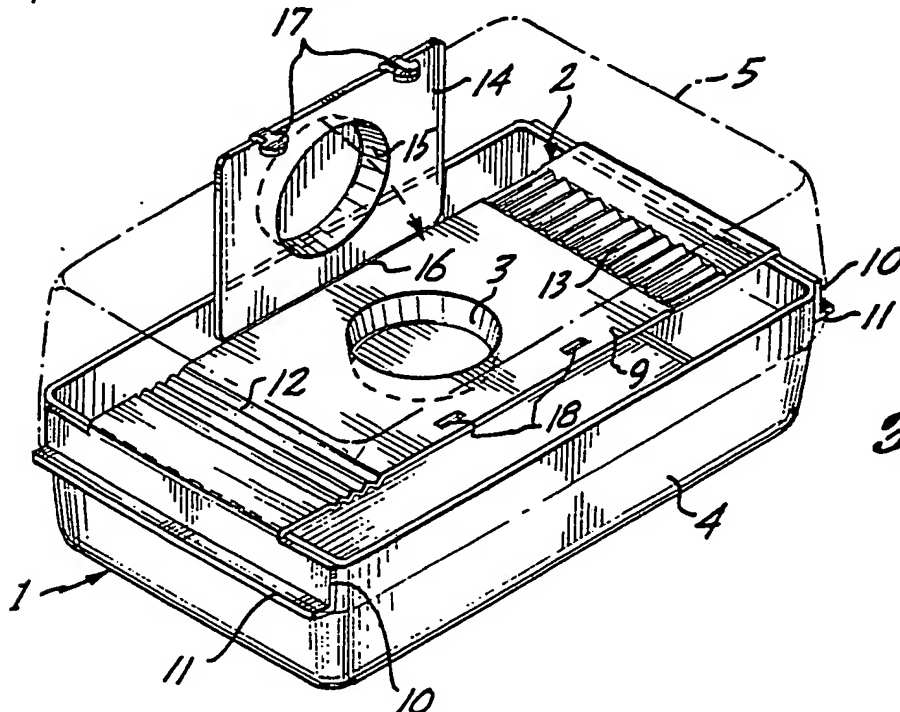
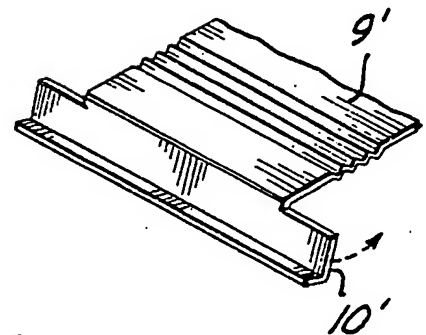


Fig. 1.

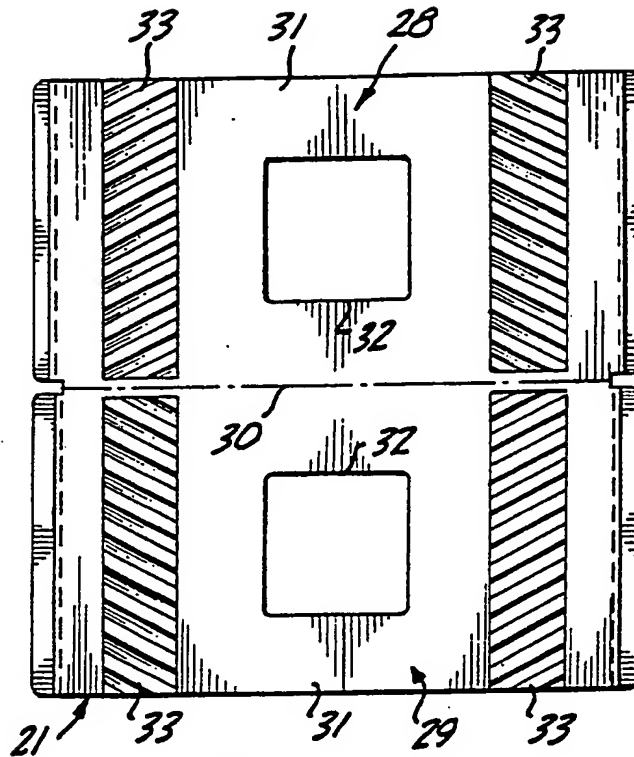


Fig. 8.

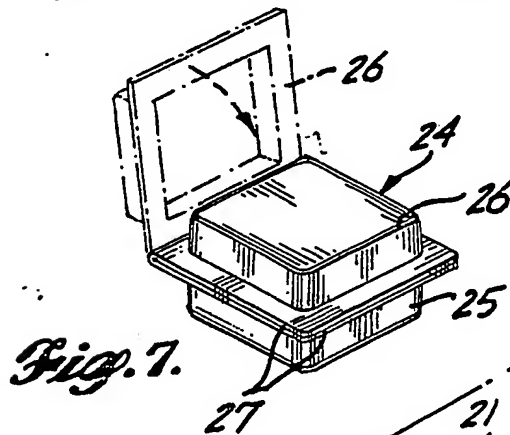


Fig. 7.

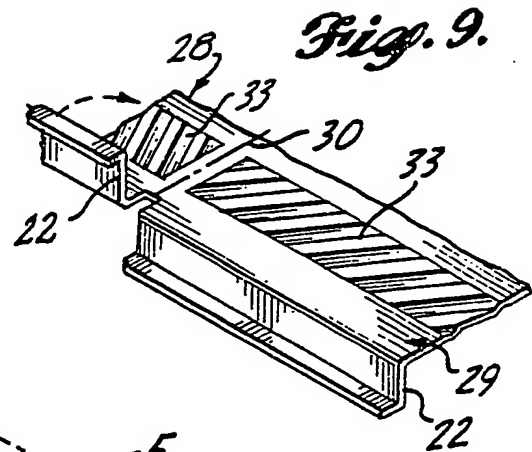


Fig. 9.

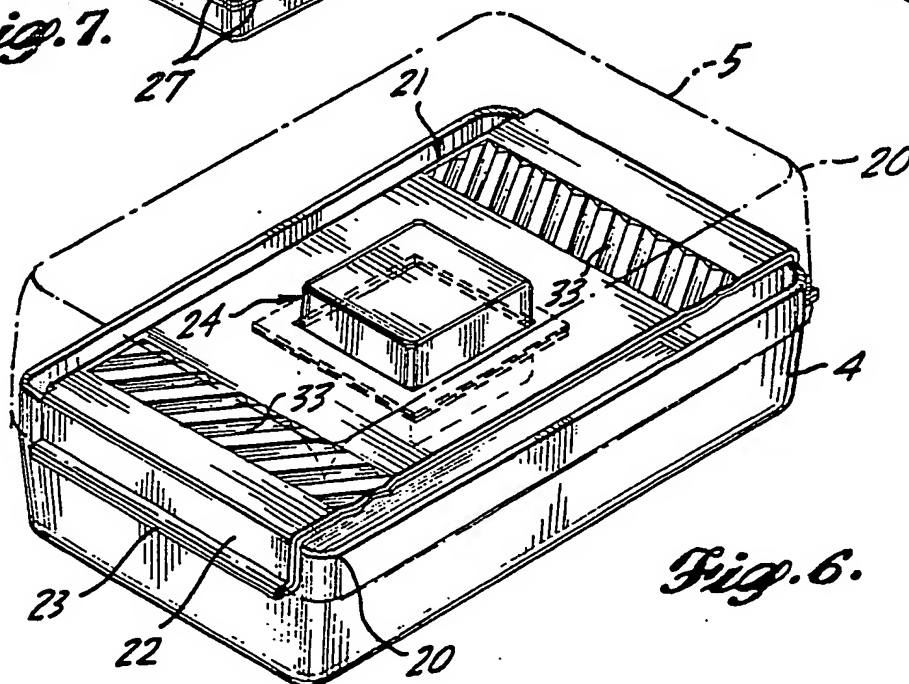
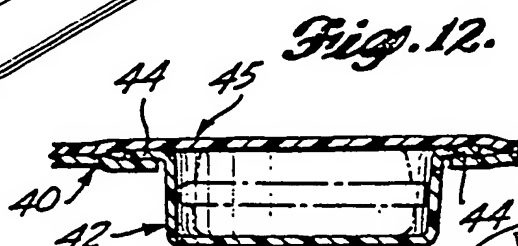
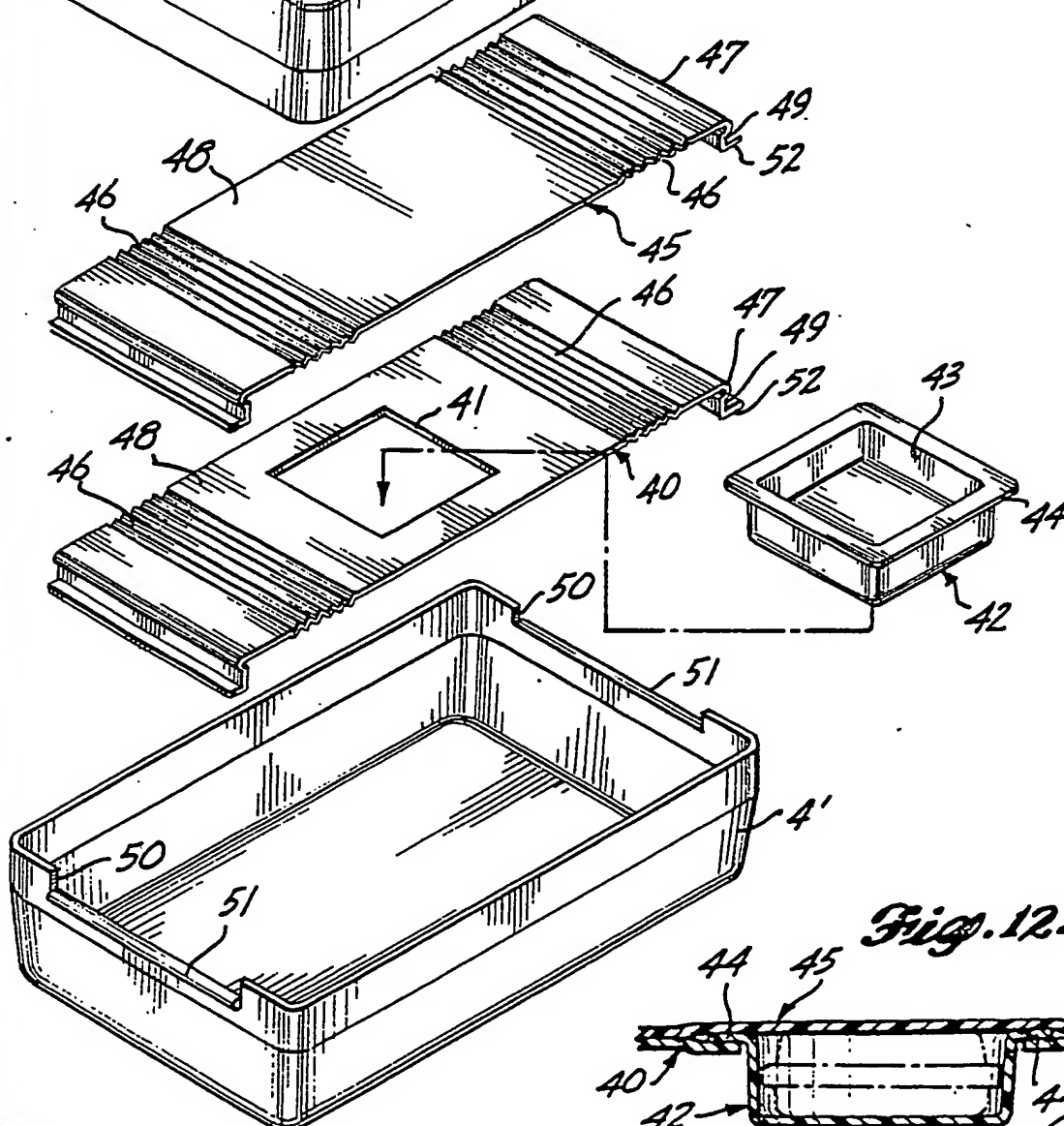
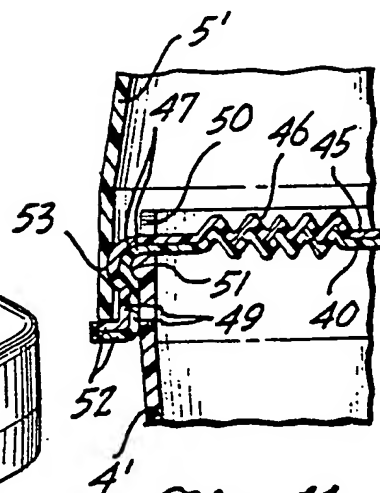
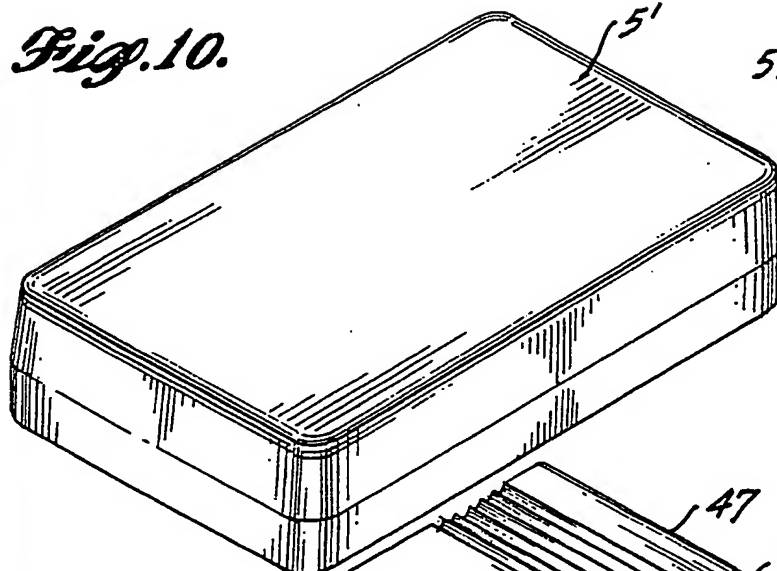


Fig. 6.

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INTERNATIONAL SEARCH REPORT

International Application No PCT/US83/00175

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC INT. CL. 3 B65D 81/10 U.S. CL. 206/583																										
II. FIELDS SEARCHED <div style="text-align: right; margin-right: 50px;">Minimum Documentation Searched ⁴</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%; border: none;">Classification System</td> <td style="border: none;">Classification Symbols</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; padding: 10px;">U.S.</td> <td style="border: 1px solid black; text-align: center; padding: 10px;">206/5.1, 583</td> </tr> </table> <div style="text-align: center; margin-top: 10px;"> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵ </div>			Classification System	Classification Symbols	U.S.	206/5.1, 583																				
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category ⁶</th> <th style="width: 70%;">Citation of Document, ¹⁶ with Indication, where appropriate, of the relevant passages ¹⁷</th> <th style="width: 20%;">Relevant to Claim No. ¹⁸</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Y</td> <td>US, A 2,865,499 Published 23 December 1958, Brogren</td> <td style="text-align: center;">A11</td> </tr> <tr> <td style="text-align: center;">Y</td> <td>DE, A 2,723,175 Published 30 November 1978, Wilhelm</td> <td style="text-align: center;">A11</td> </tr> <tr> <td style="text-align: center;">Y</td> <td>BE, A 637,711 Published 23 September 1966, Giovanni</td> <td style="text-align: center;">A11</td> </tr> <tr> <td style="text-align: center;">&</td> <td>US, A 2,501,570 Published 21 March 1950, Lorsen</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">&</td> <td>US, A 2,681,142 Published 15 June 1954, Cohen</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">&</td> <td>US, A 2,811,246 Published 29 October 1957, Sloane</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">A</td> <td>US, A 3,089,500 Published 14 May 1963, Stalcup</td> <td style="text-align: center;">-</td> </tr> </tbody> </table>			Category ⁶	Citation of Document, ¹⁶ with Indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸	Y	US, A 2,865,499 Published 23 December 1958, Brogren	A11	Y	DE, A 2,723,175 Published 30 November 1978, Wilhelm	A11	Y	BE, A 637,711 Published 23 September 1966, Giovanni	A11	&	US, A 2,501,570 Published 21 March 1950, Lorsen	-	&	US, A 2,681,142 Published 15 June 1954, Cohen	-	&	US, A 2,811,246 Published 29 October 1957, Sloane	-	A	US, A 3,089,500 Published 14 May 1963, Stalcup	-
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A	US, A 3,089,500 Published 14 May 1963, Stalcup	-																								
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International Searching Authority ¹ <div style="text-align: center; font-size: 1.2em;">ISA/US</div>		Signature of Authorized Officer ³ 																								

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